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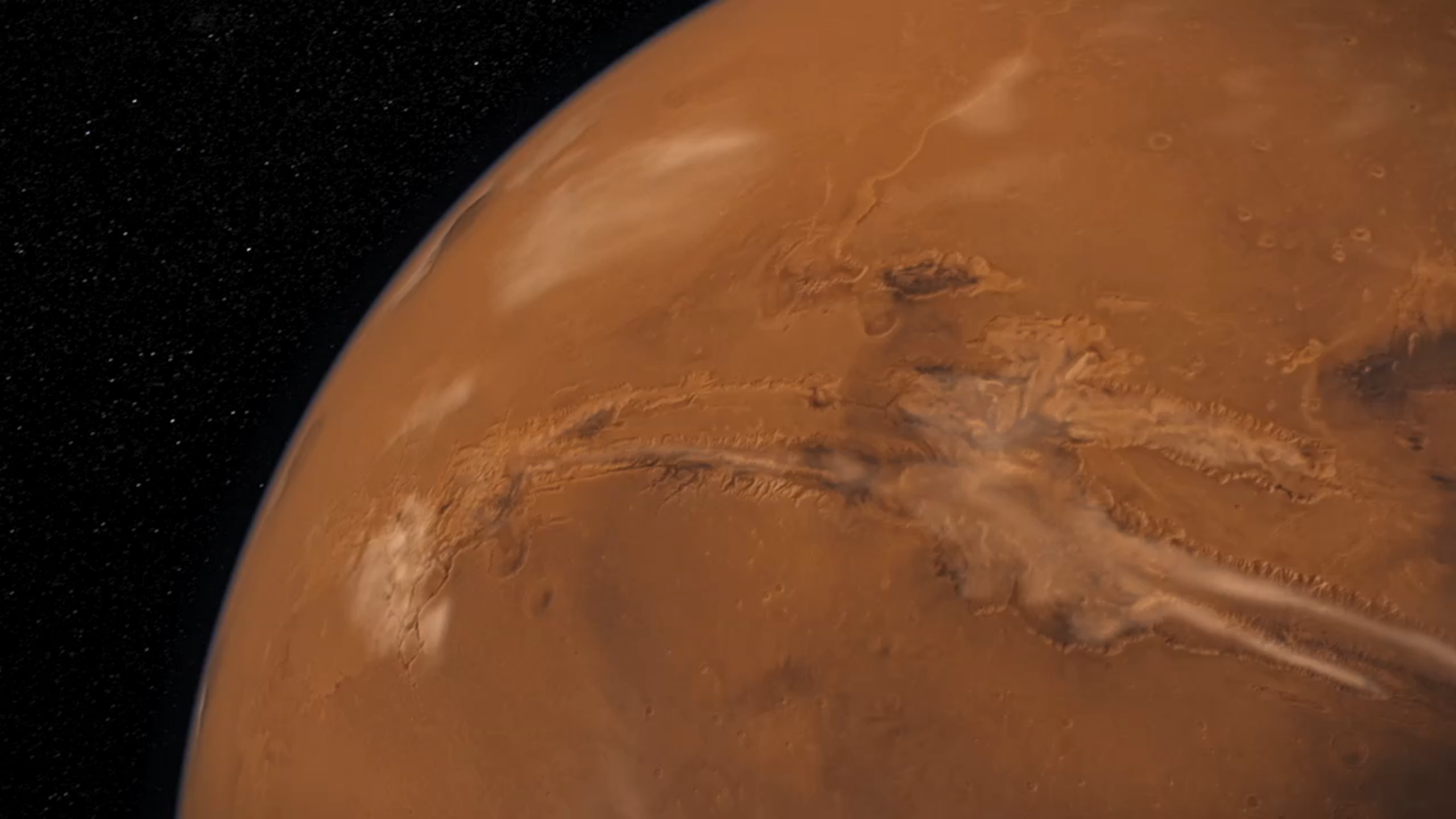
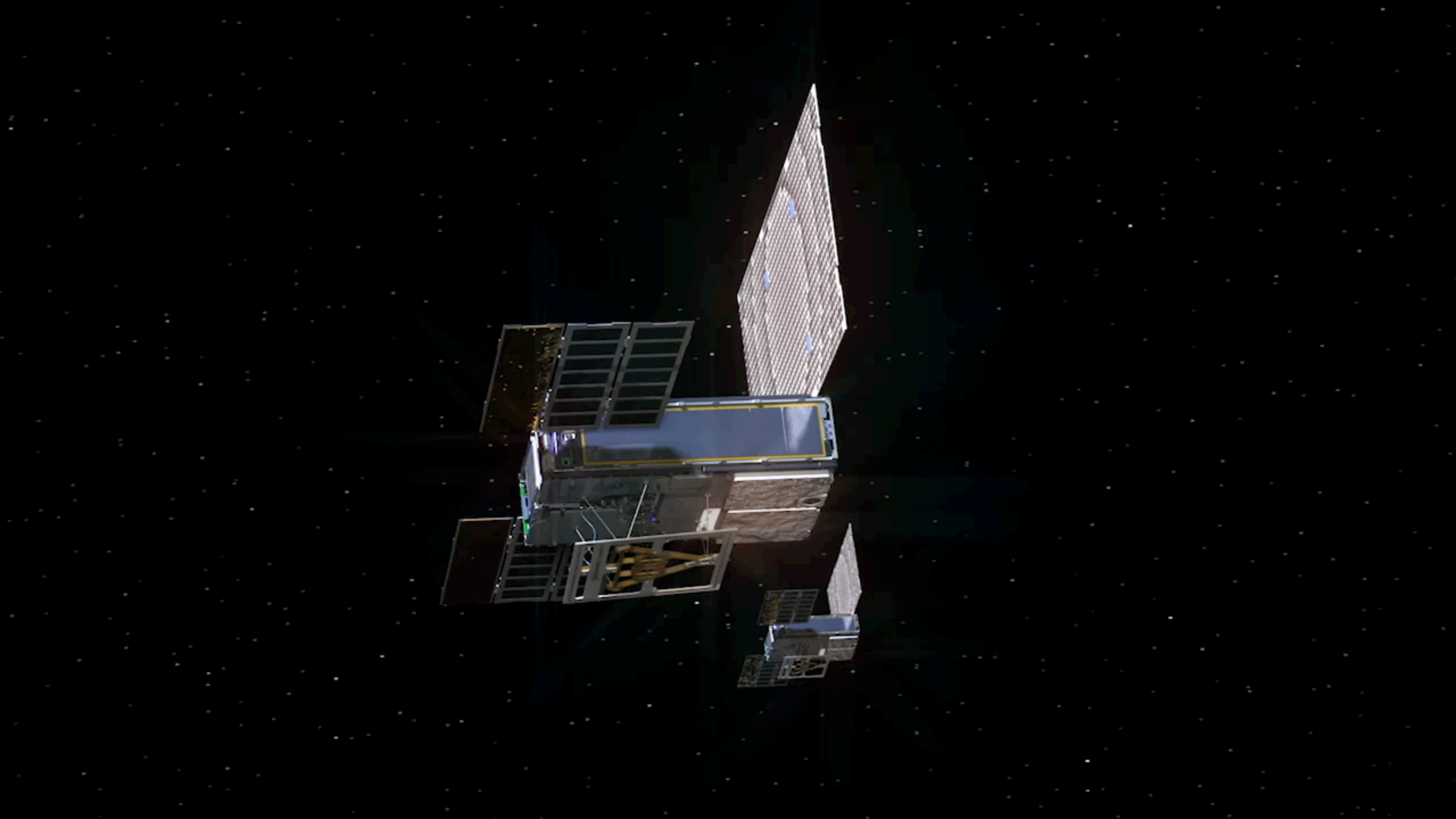
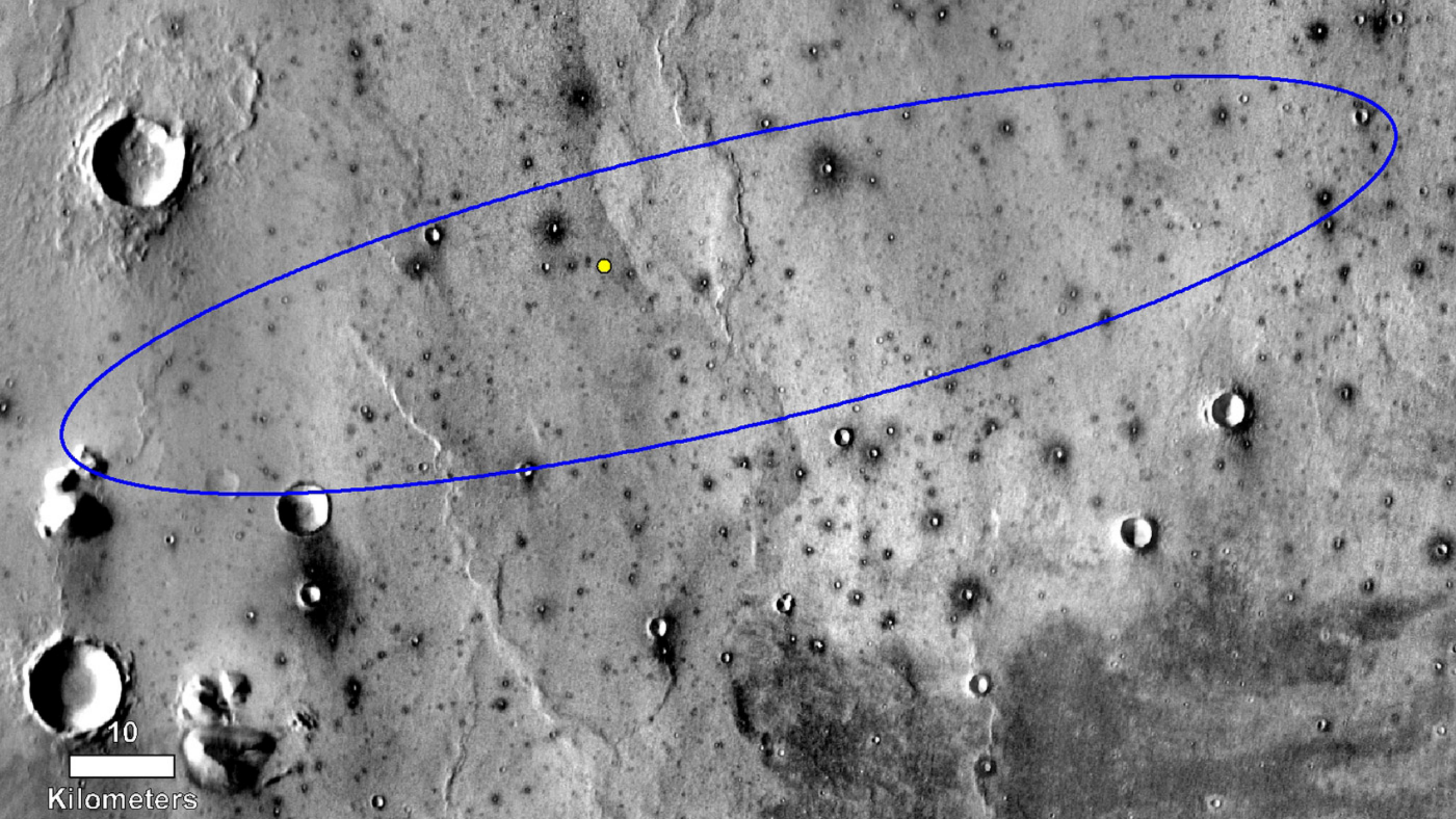
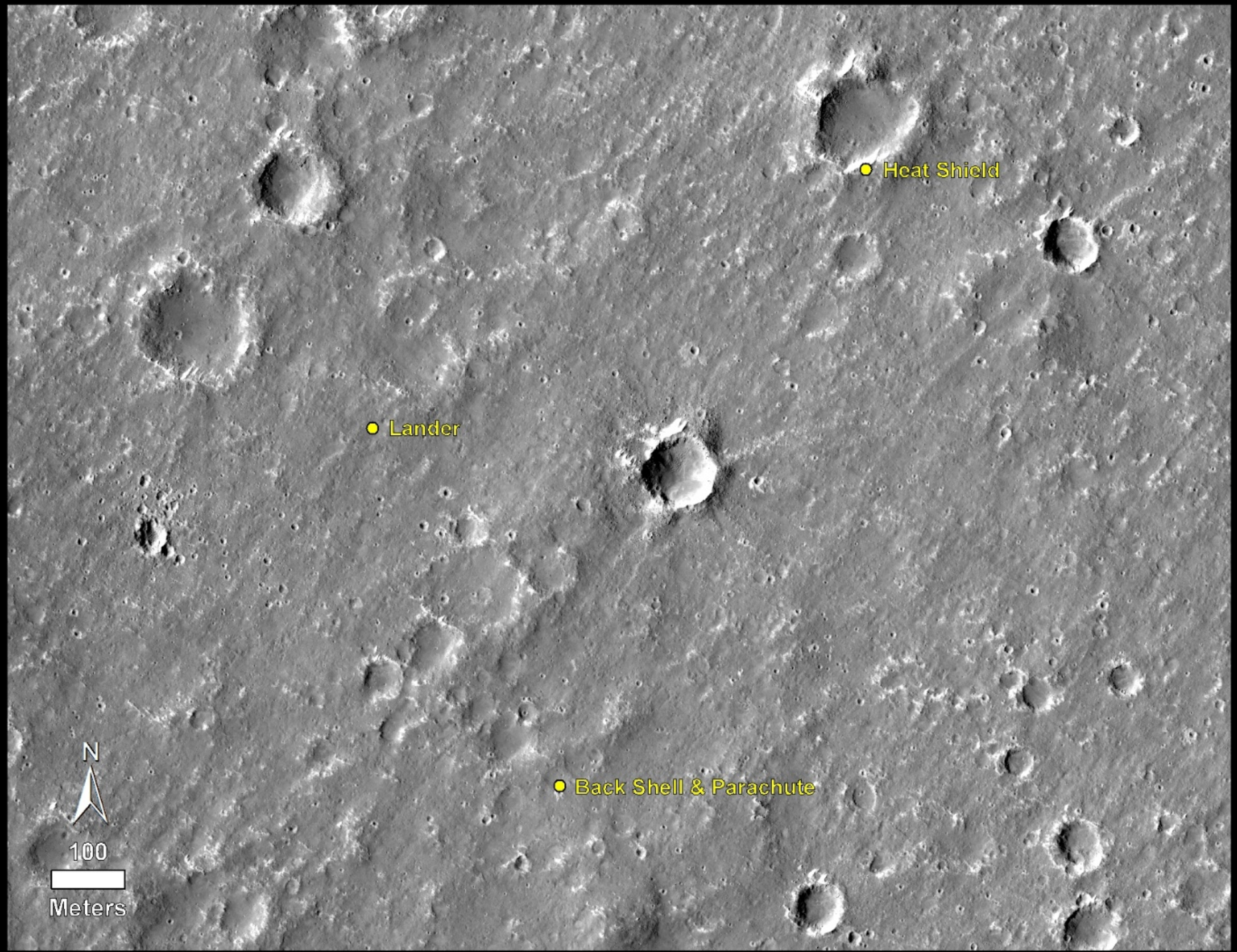
InSight Mission to Mars: Early Operational Results

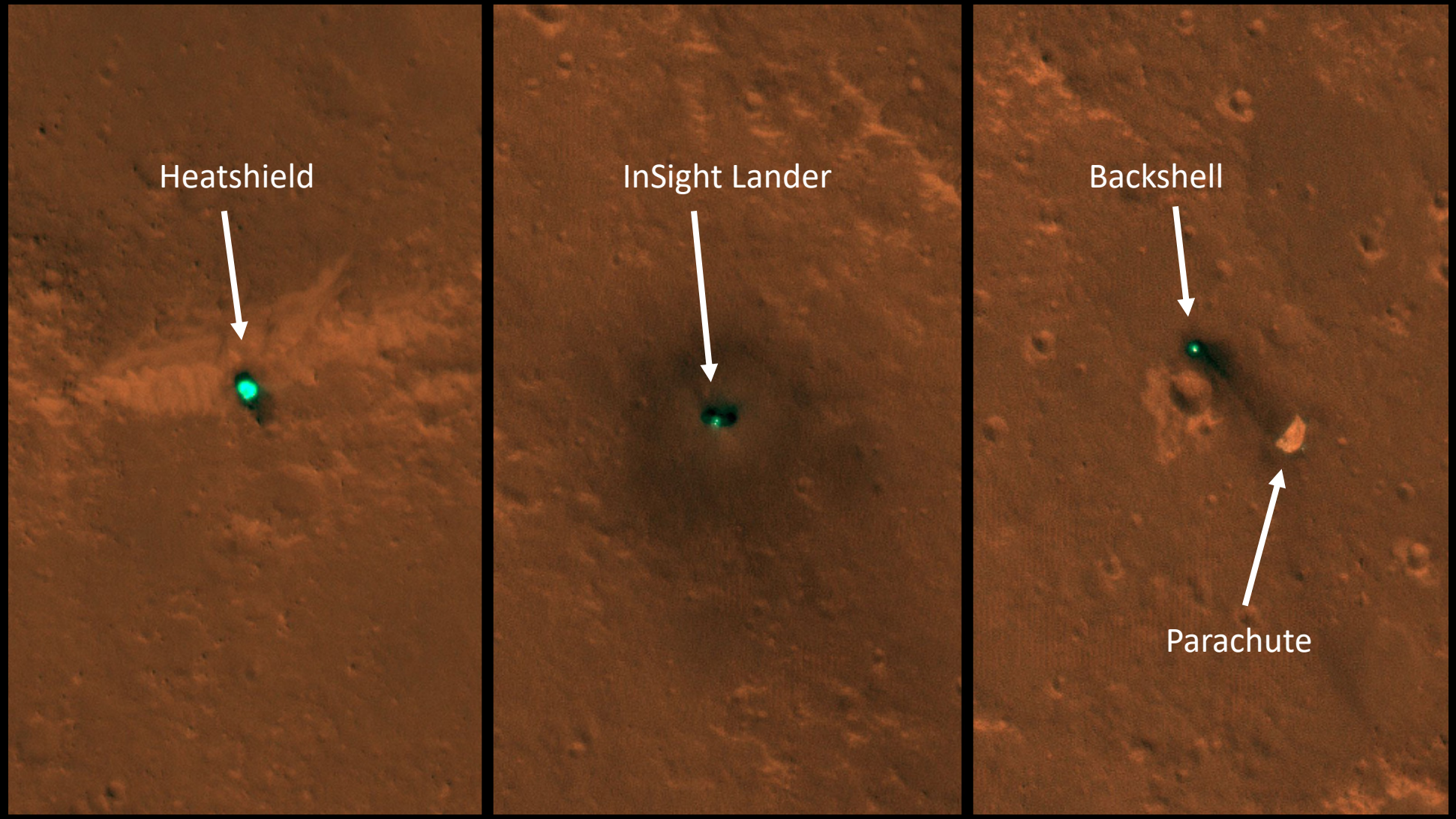





10
Kilometers


Heat Shield
Lander
Back Shell & Parachute
N
100
Meters

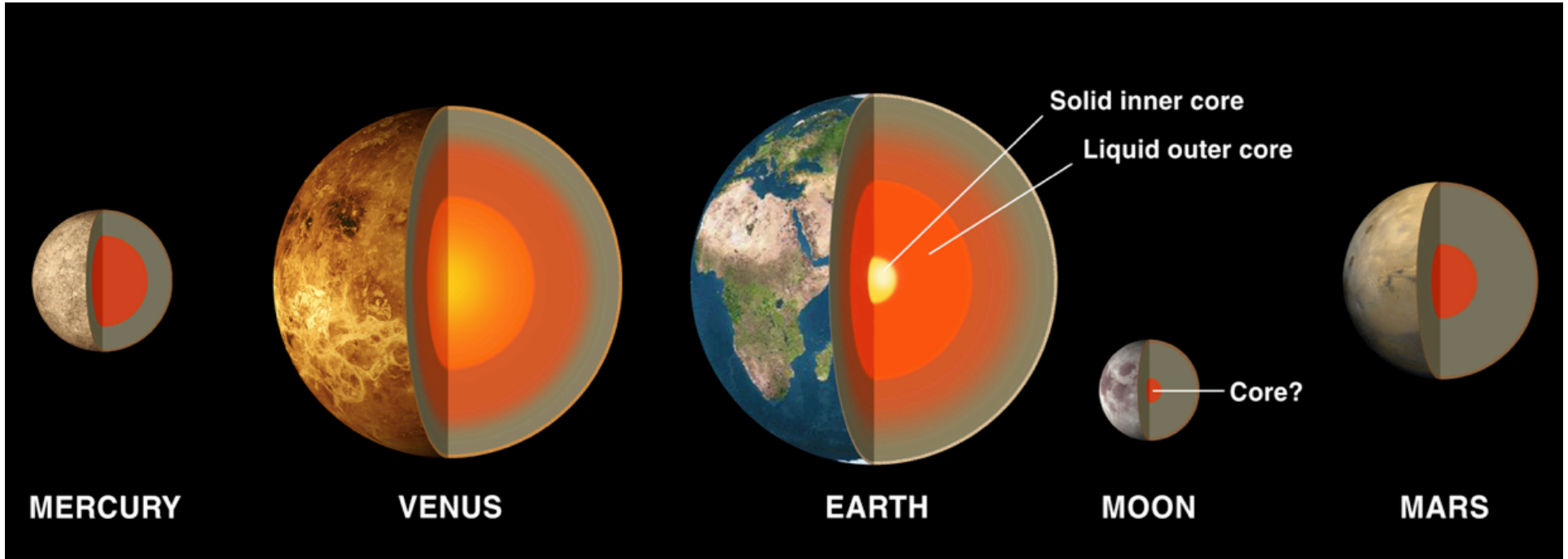
InSight Viewed from Mars Reconnaissance Orbiter

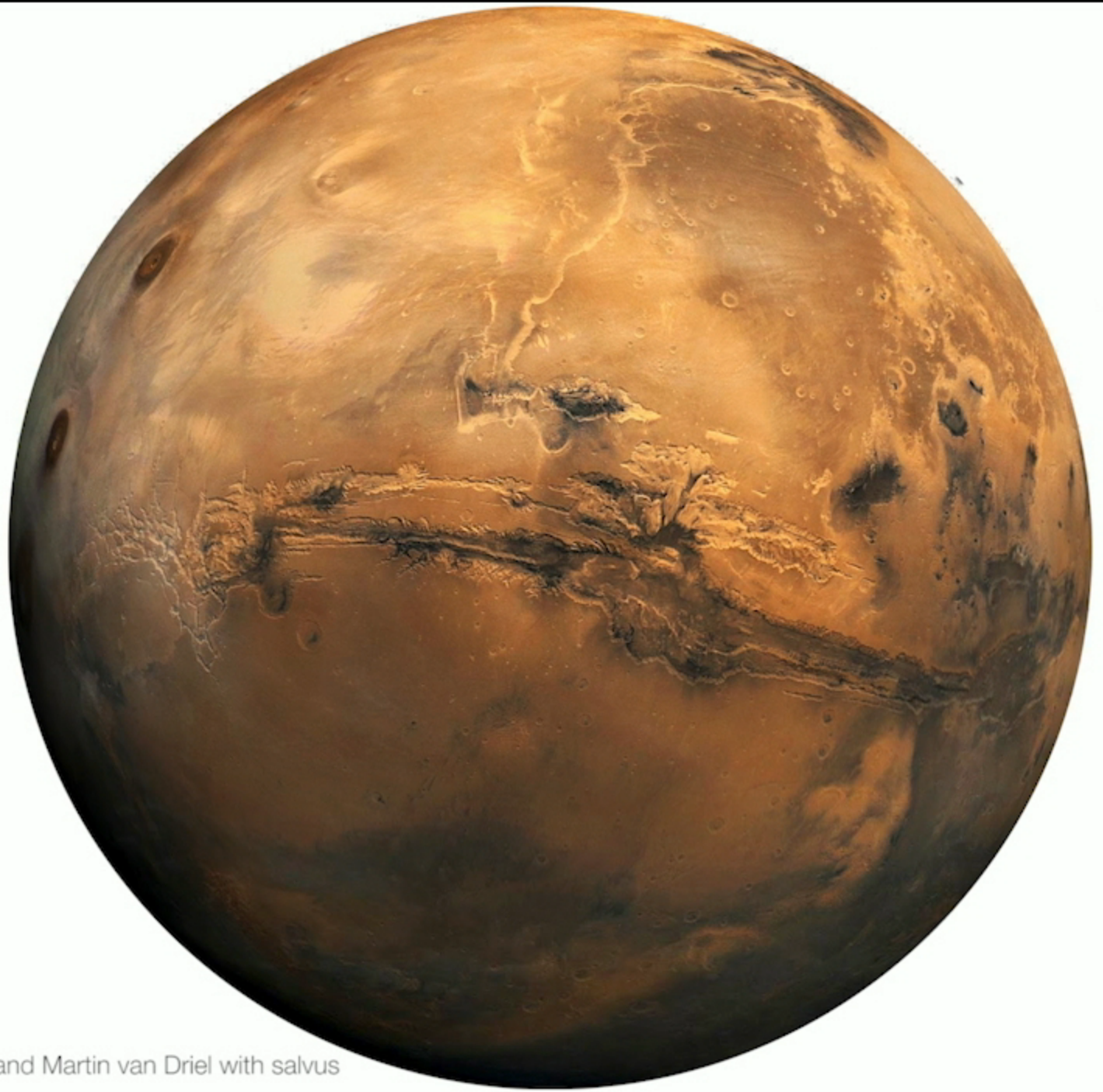


THE SCIENCE

Science Goal

Understand the formation and evolution of **all** terrestrial planets through investigation of the interior structure and processes of Mars.





Computed by Lion Krischer and Martin van Driel with salvus


Time: 0 sec
Z
R
SV - waves
P - waves
Computed by Martin van Driel with AxiSEM

Clip of the sound of Wind and a marsquake

THE INSTRUMENTS

Checking the Health of Mars

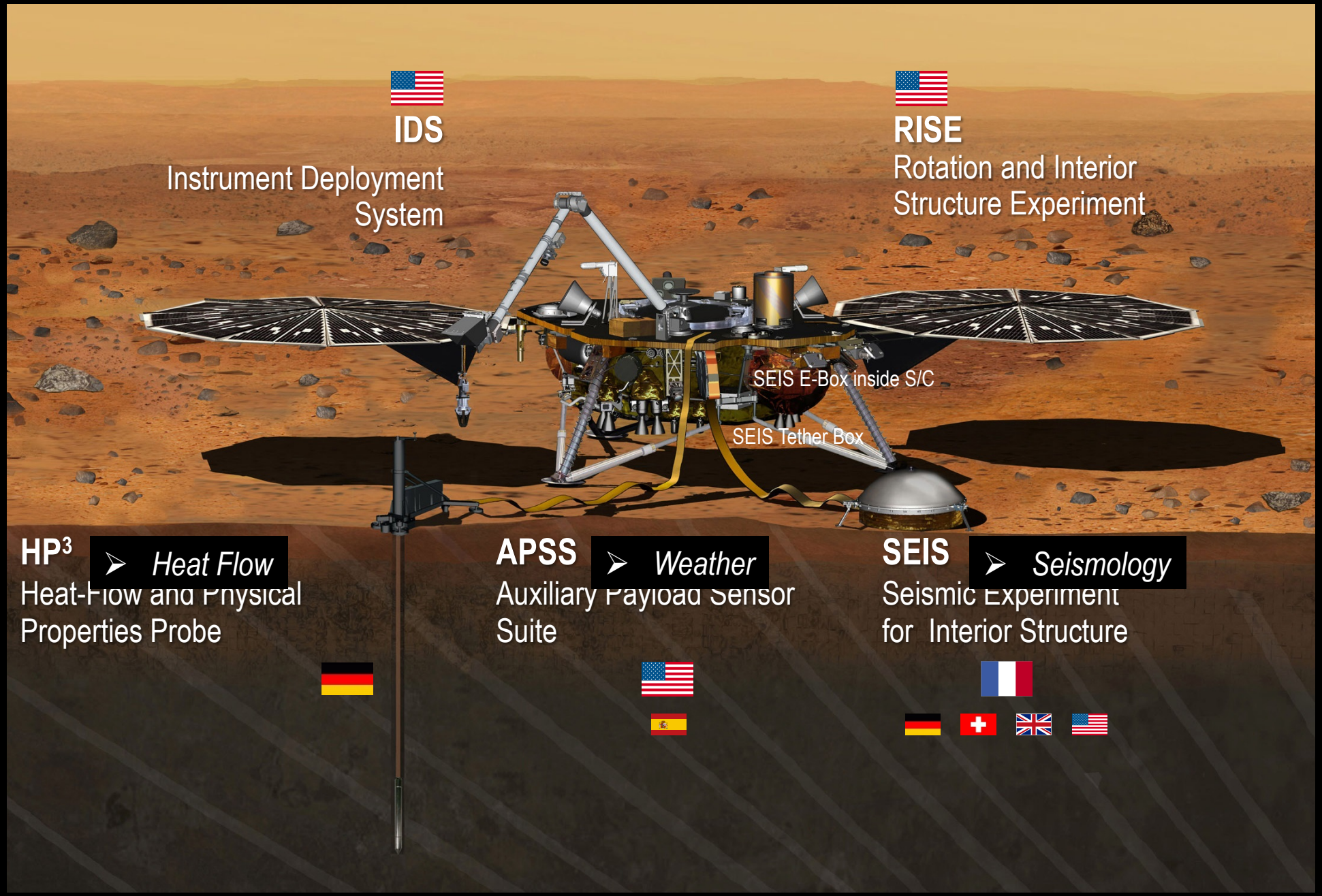
InSight will be using its science instruments to take the “vital signs” of Mars

its pulse (seismology),

its temperature (heat flow)

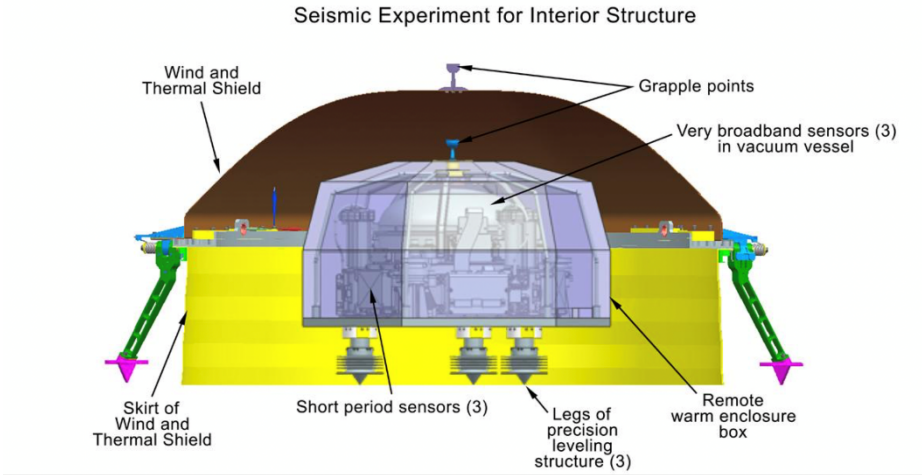
its reflexes (radio science)

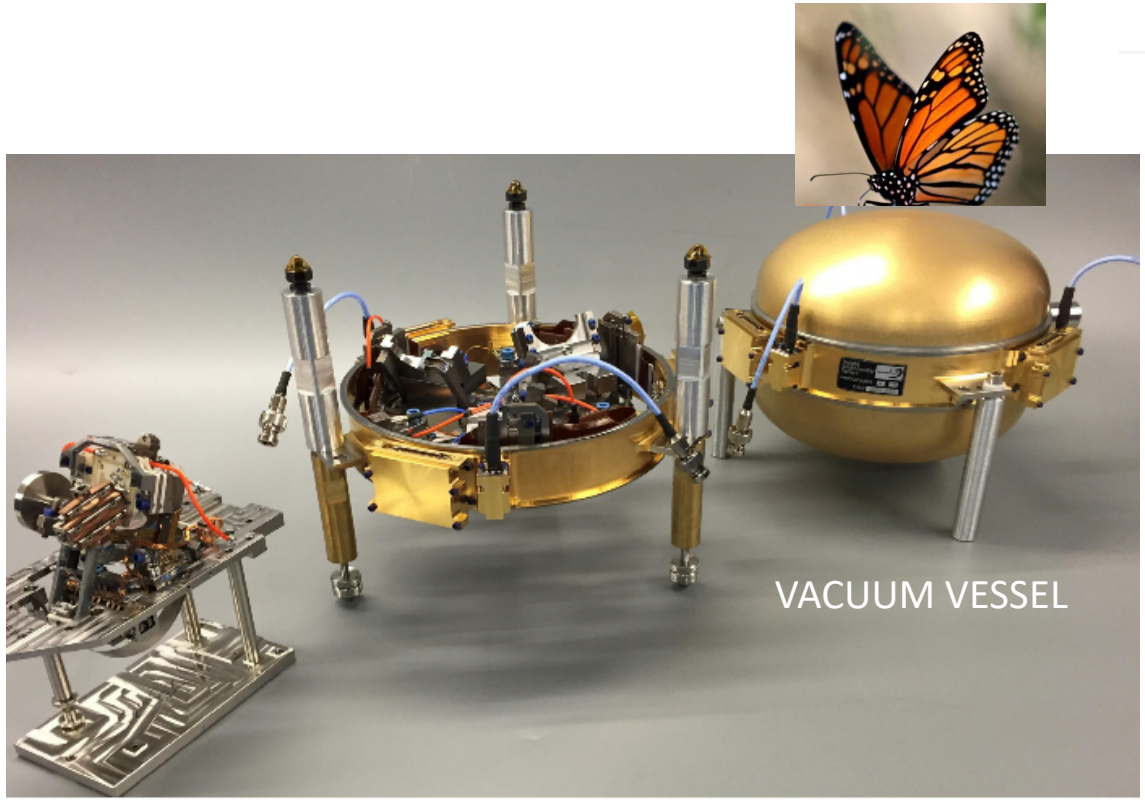
InSight Payloads



InSight Seismometer

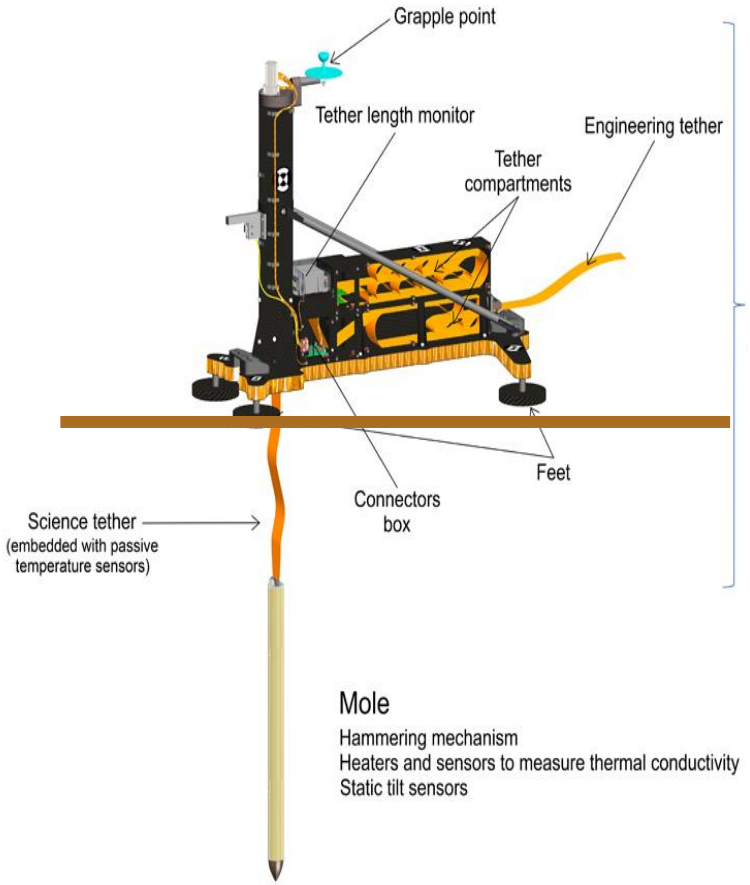
- InSight seismometer combines two types of sensors
  - 3 is an ultra-sensitive "very broad band"
  - 3 is a short-period instrument, adding capability for higher-frequency vibrations.





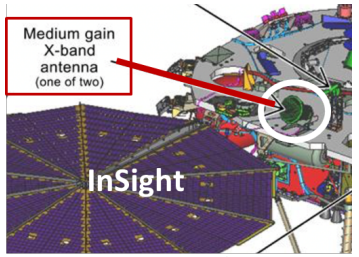
HP^3 (Heat Flow and Physical Properties Package)

- The instrument's mole is expected to use between 5,000 and 20,000 hammering strokes, over at least 45 days, to reach 10-16 feet depth
- The mole carries sensors and heaters to determine the *thermal conductivity* of the ground around it.
- The science tether contains precise temperature sensors every ~1 foot to measure the temperature changes with depth (*thermal gradient*)
- When combined with the conductivity information determines the heat flux

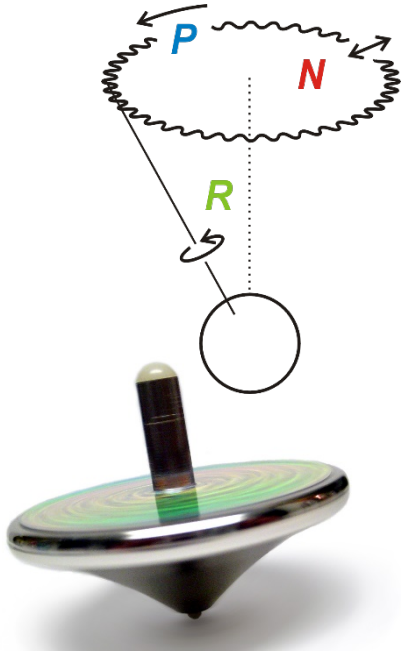


The mole is about a U.S. quarter in diameter and the length of a forearm.

Sizing Up the Core of Mars



X-band Link

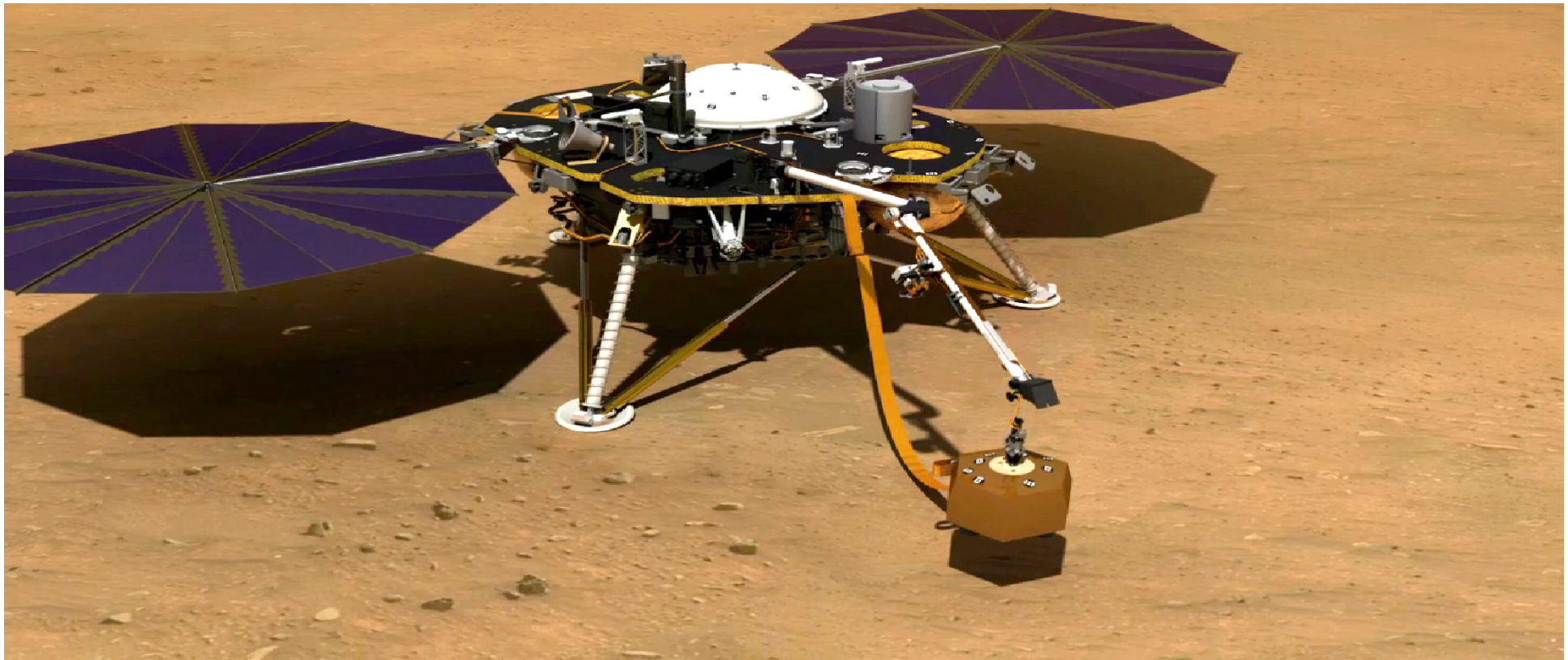


- Perturbations of a planet rotation axis can provide information about the planet's core. The perturbations resemble the wobble of a spinning top, and occur on two time scales.

- **The longer wobble, called precession**, takes about 165,000 years and is the same as the process that makes a top wobble. The speed of this precession is directly related to the proportion of the body's mass that is close to the center.

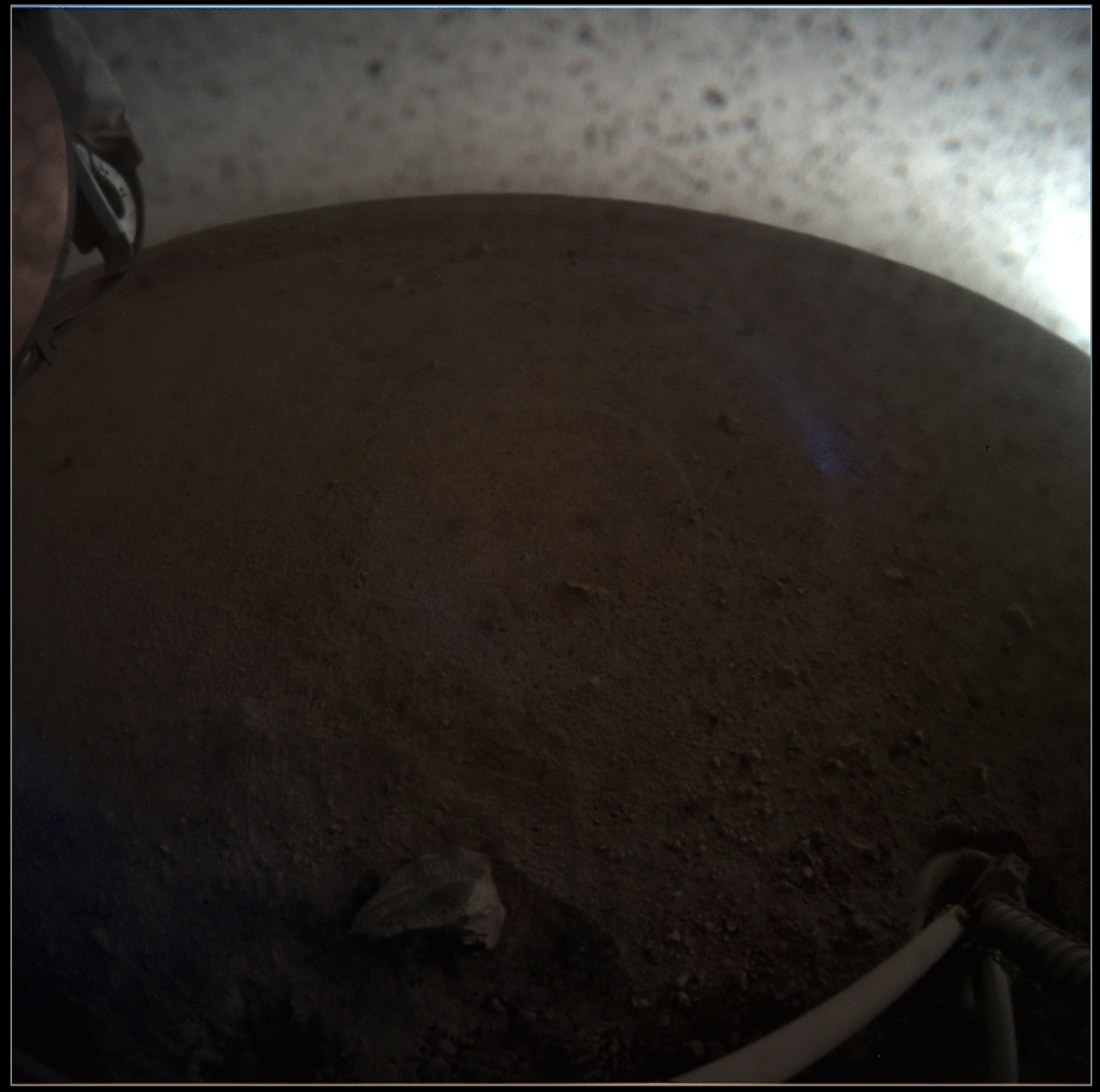
- **The shorter-period wobbles, called nutation**, occurs on time scales of less than a year and are extremely small. Their cause is unrelated to a toy top's wobble. A closer analogy is the traditional method for determining whether an egg is hard-boiled by spinning it. An egg with a solid center spins easily. The liquid center of a raw egg perturbs the spin.

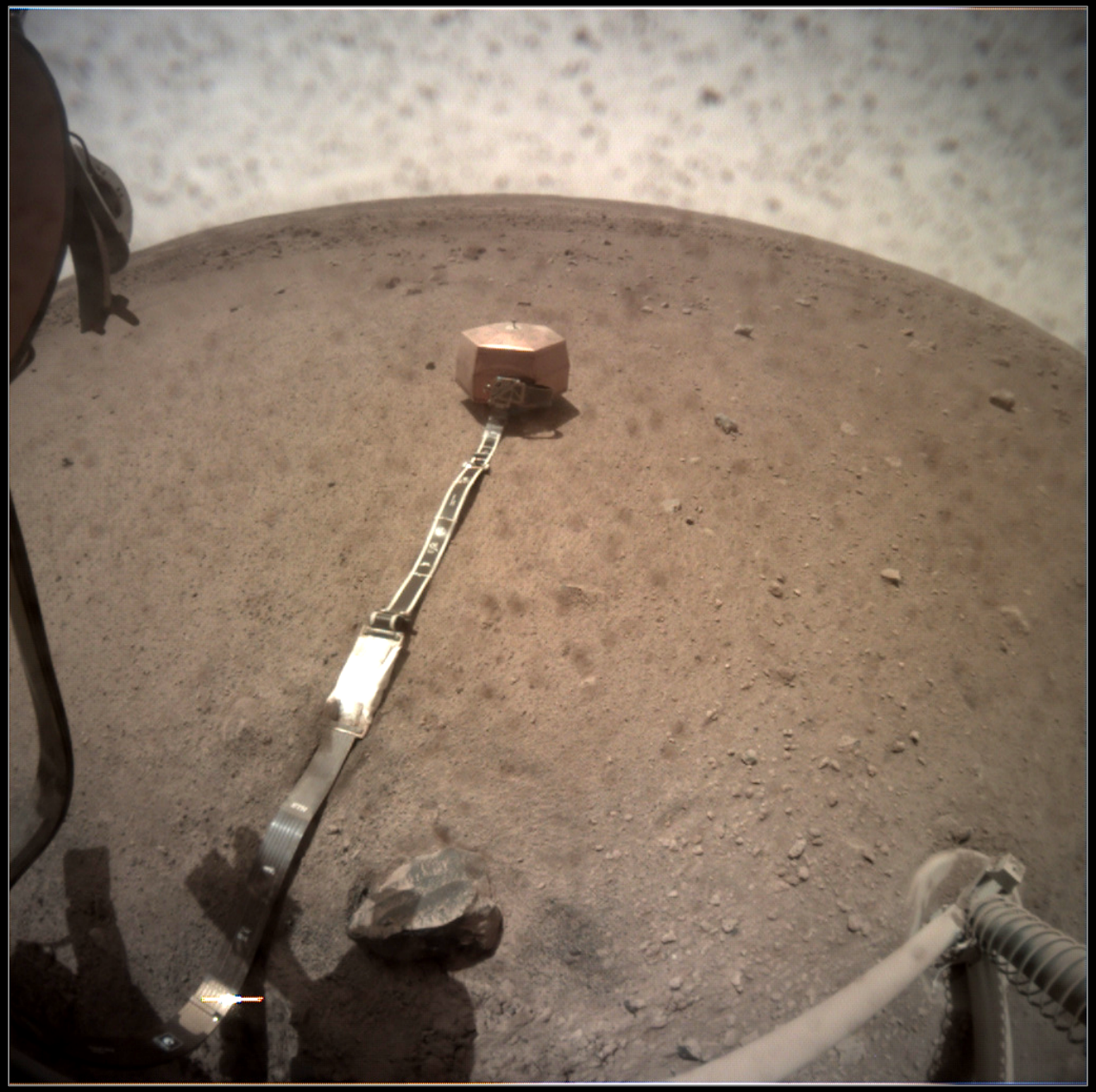
INSTRUMENT DEPLOYMENT AND OPERATIONS



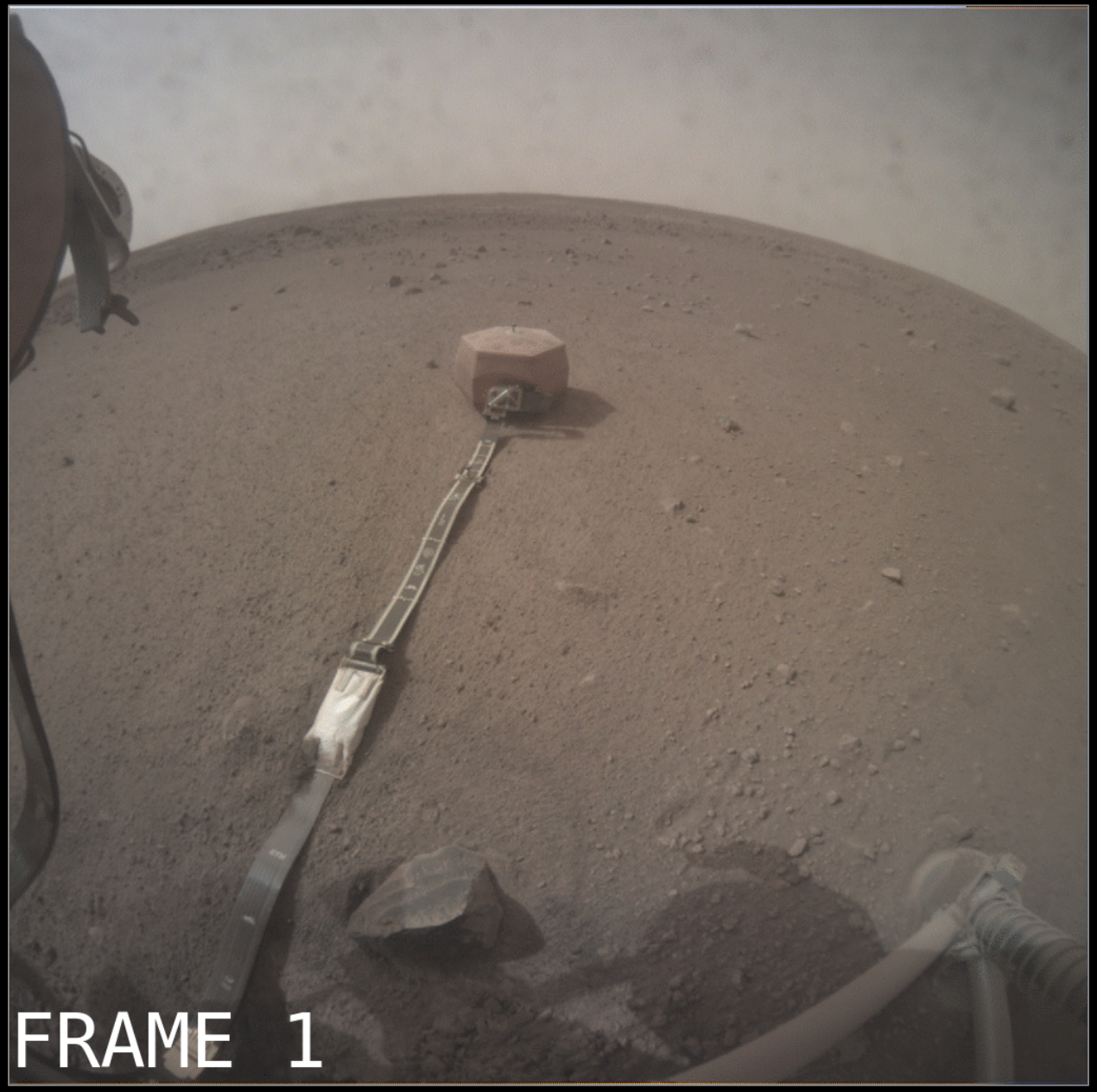
Post-touchdown Image

SEIS Deployment Sequence

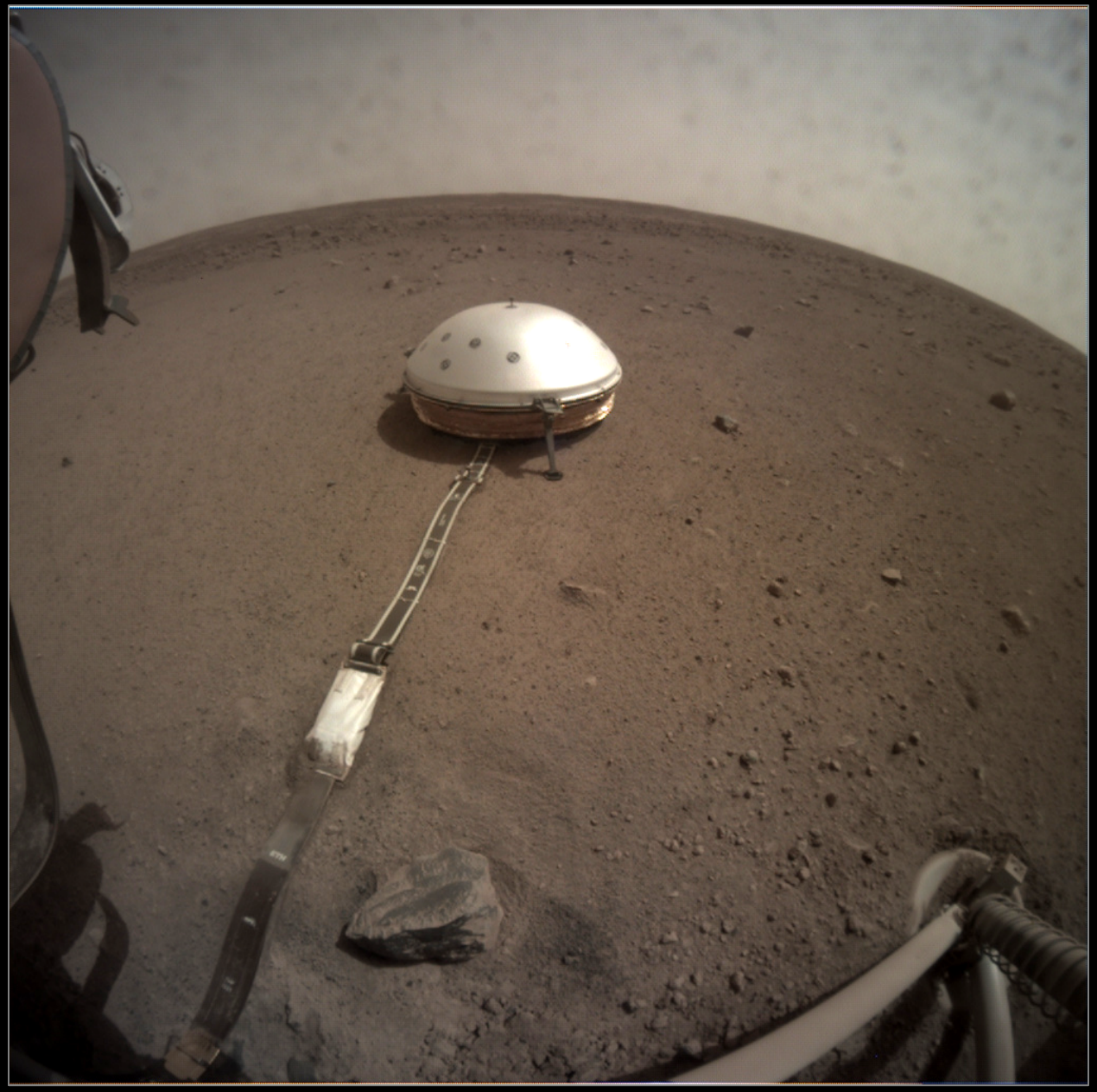




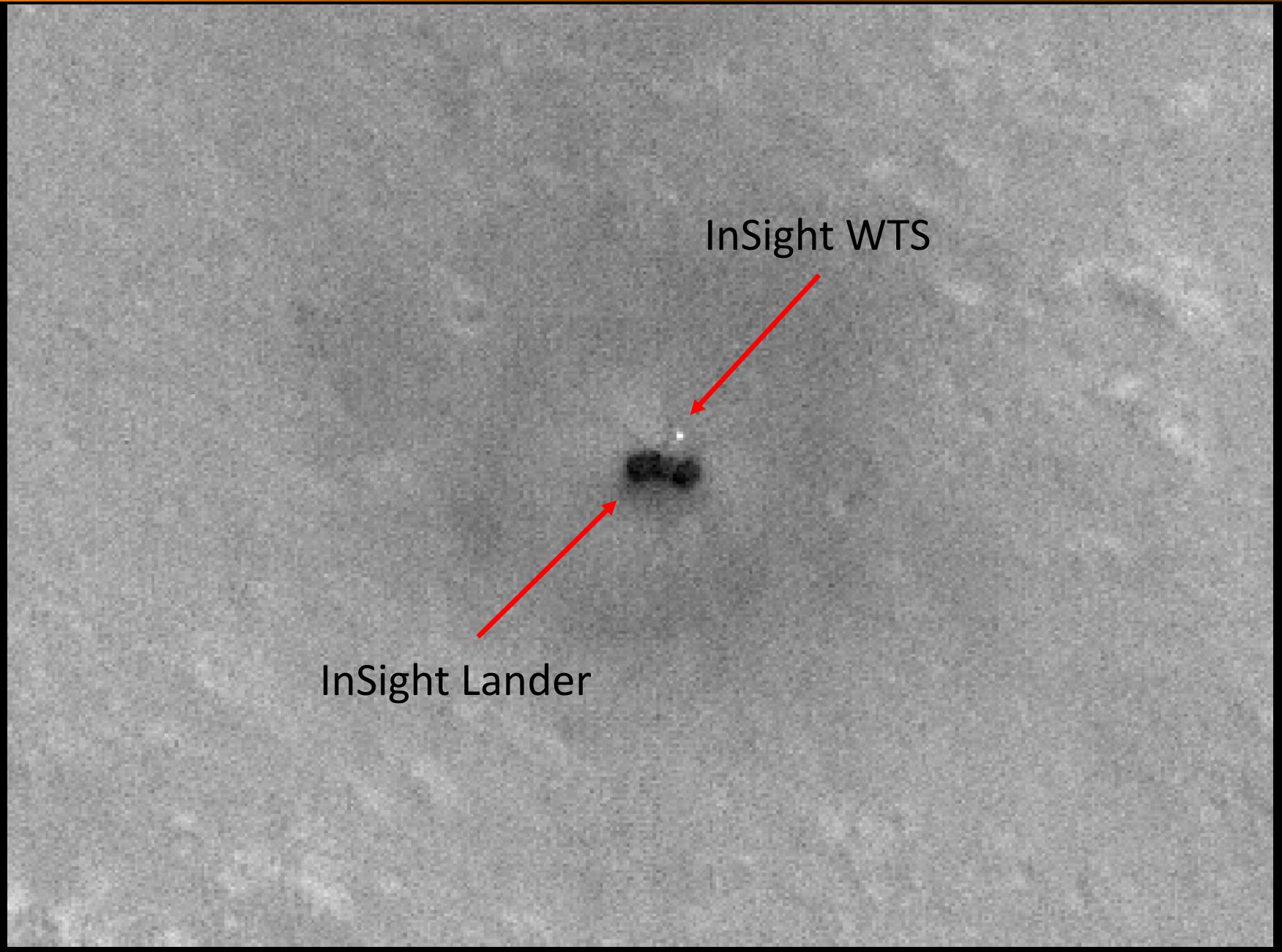
Wind & Thermal Shield Deployment Sequence



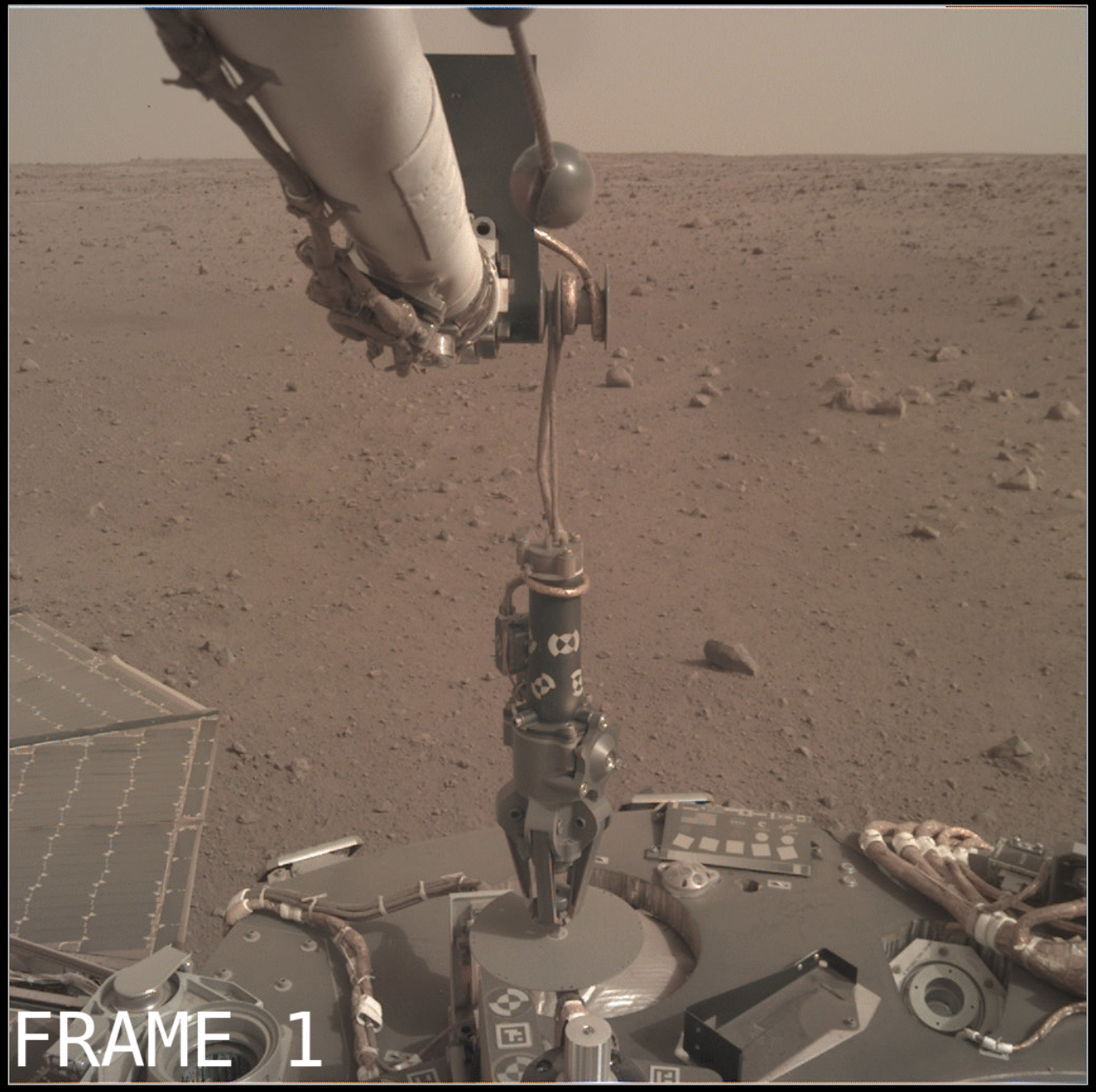
Wind & Thermal Shield on Mars



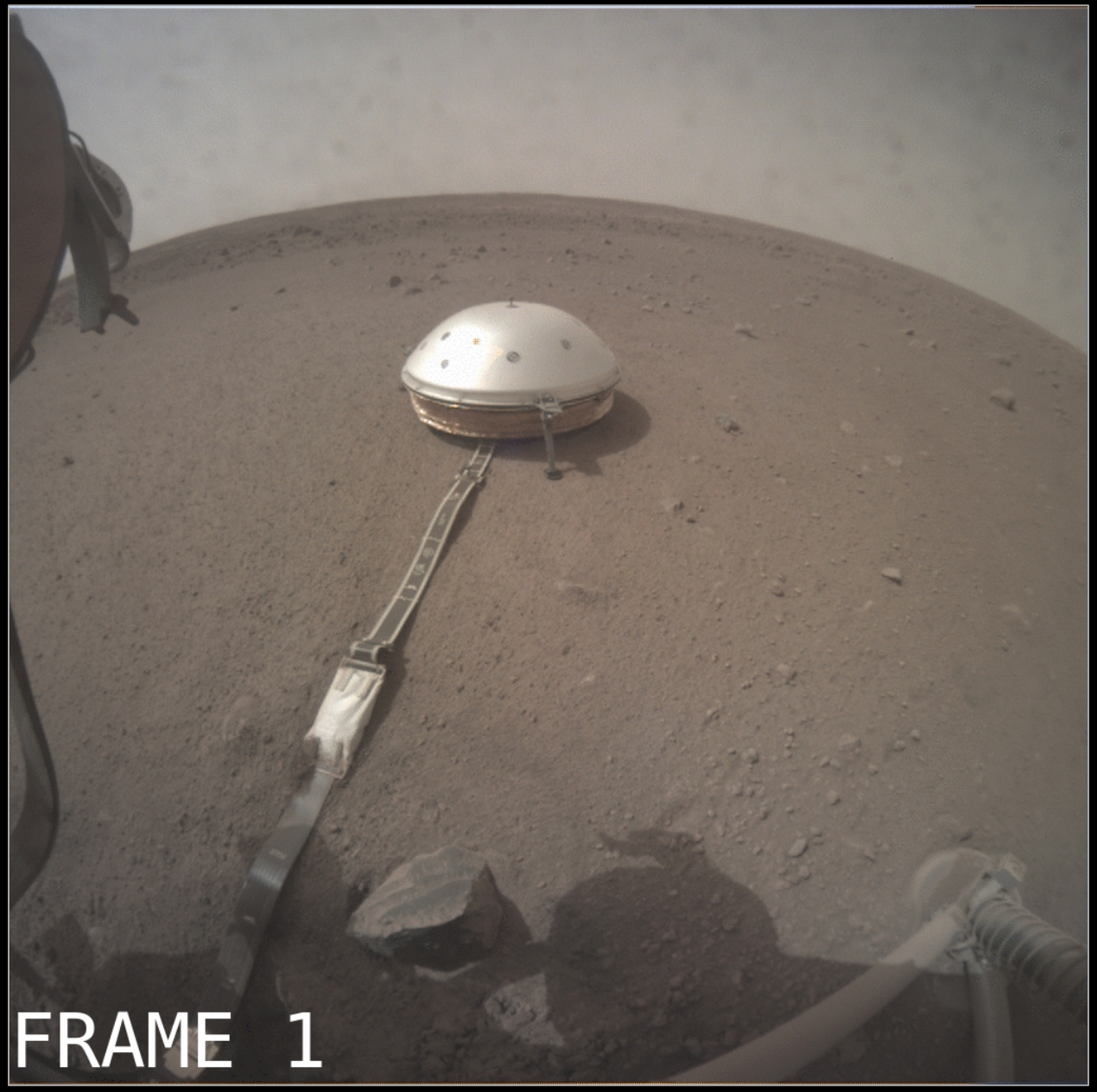
SEIS WTS from MRO



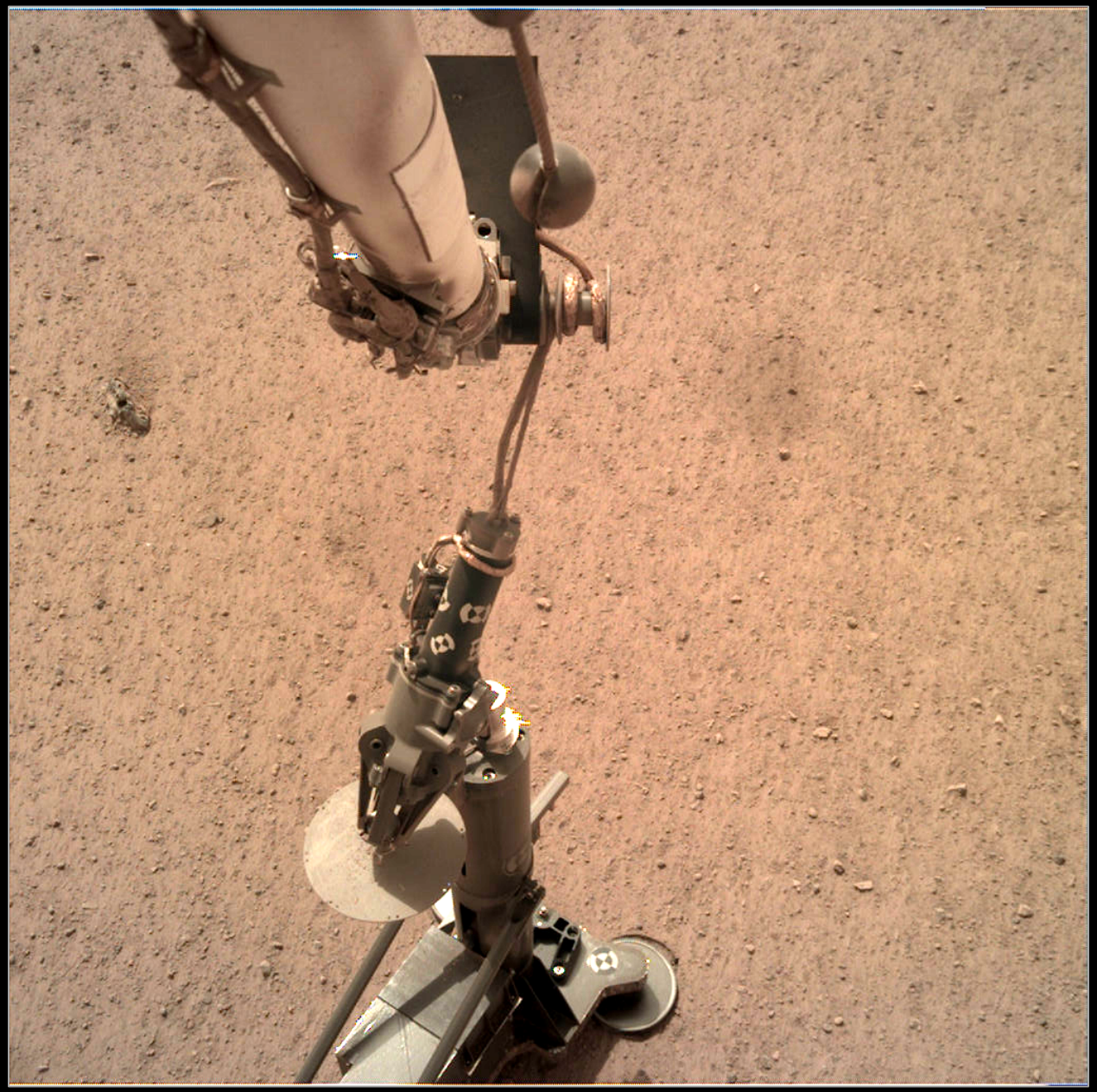
Heat Probe Grappling Sequence



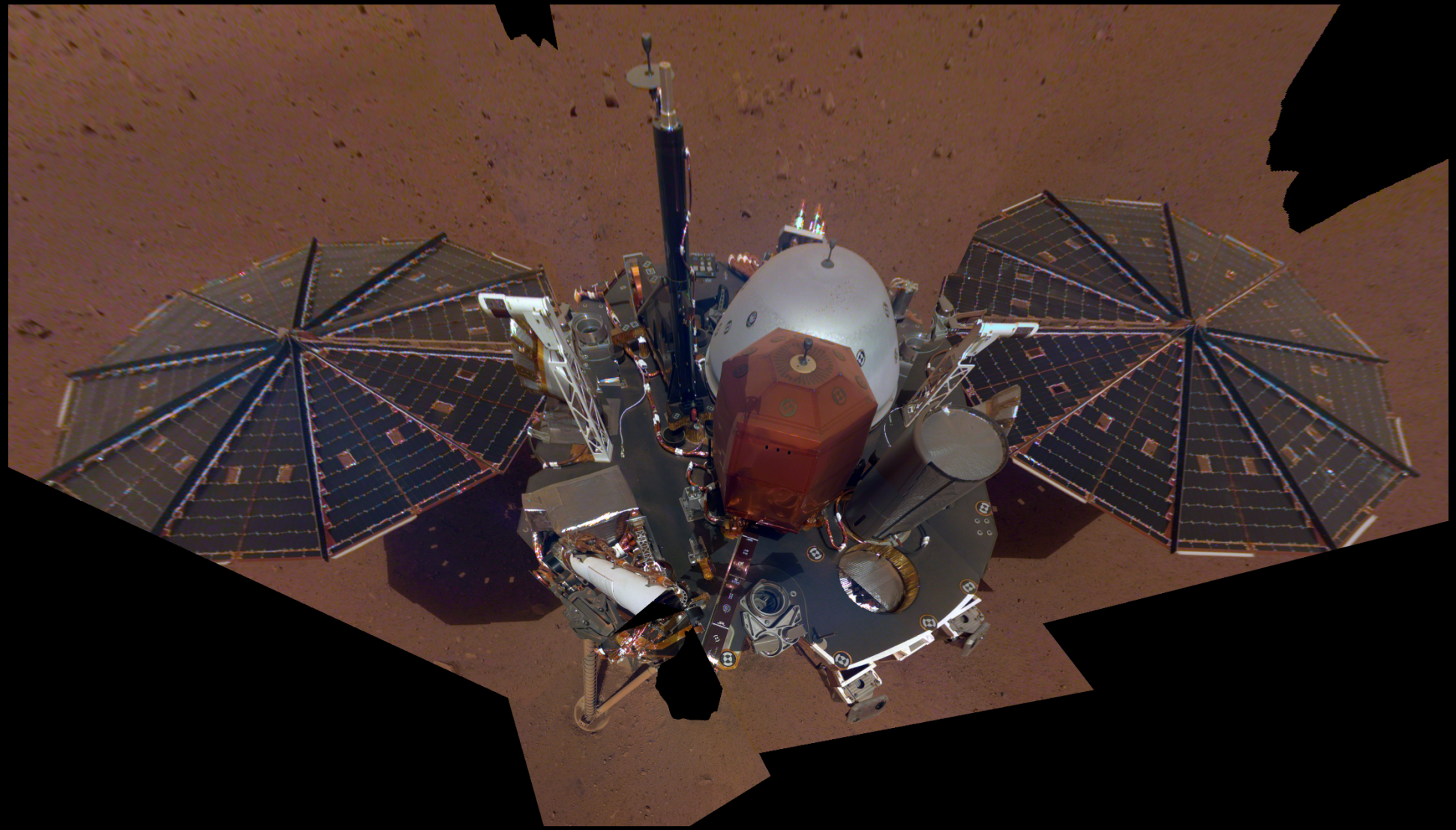
Heat Probe Deployment Sequence



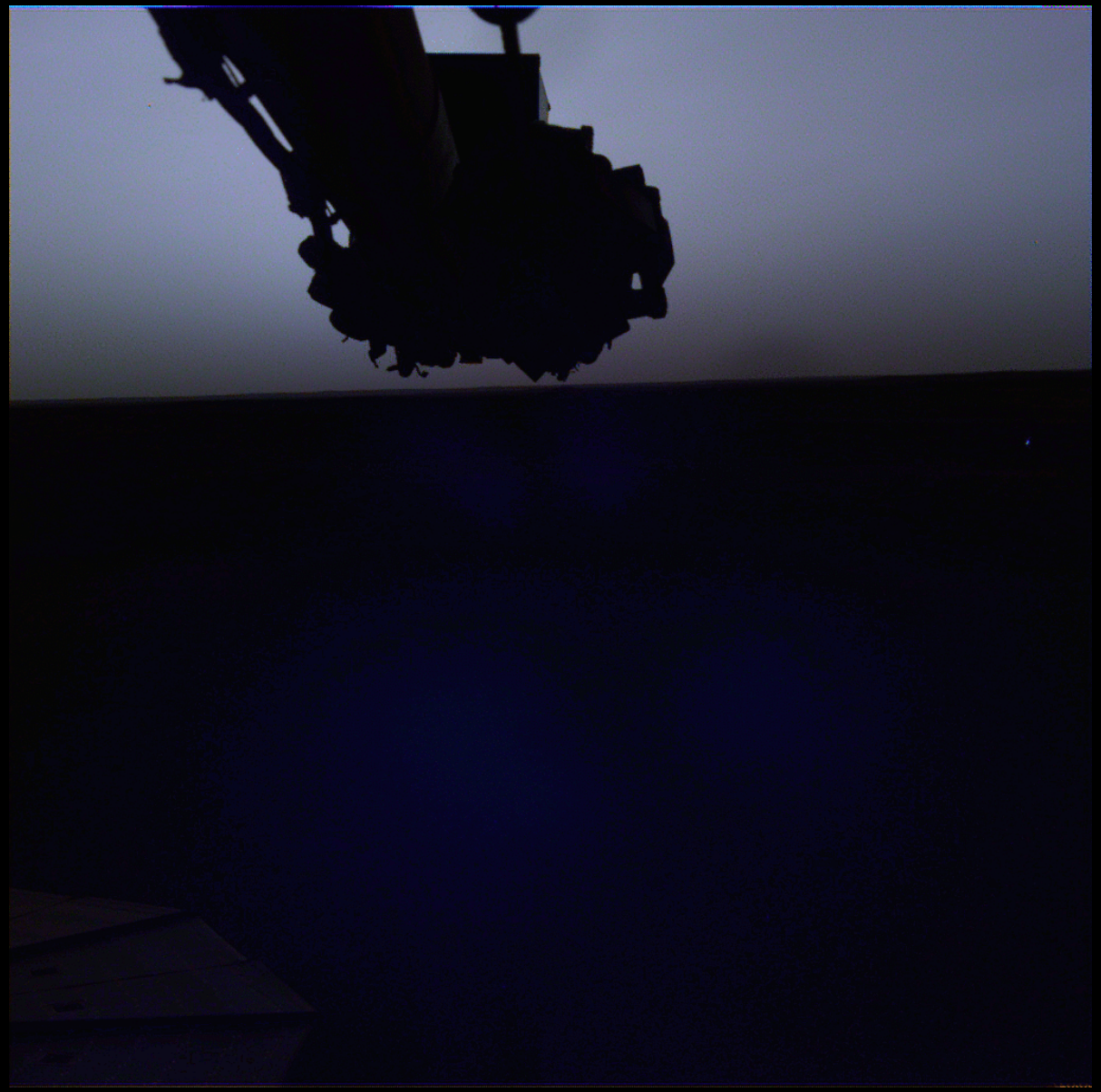
Heat Probe on Mars (with grapple)



InSight's First Selfie

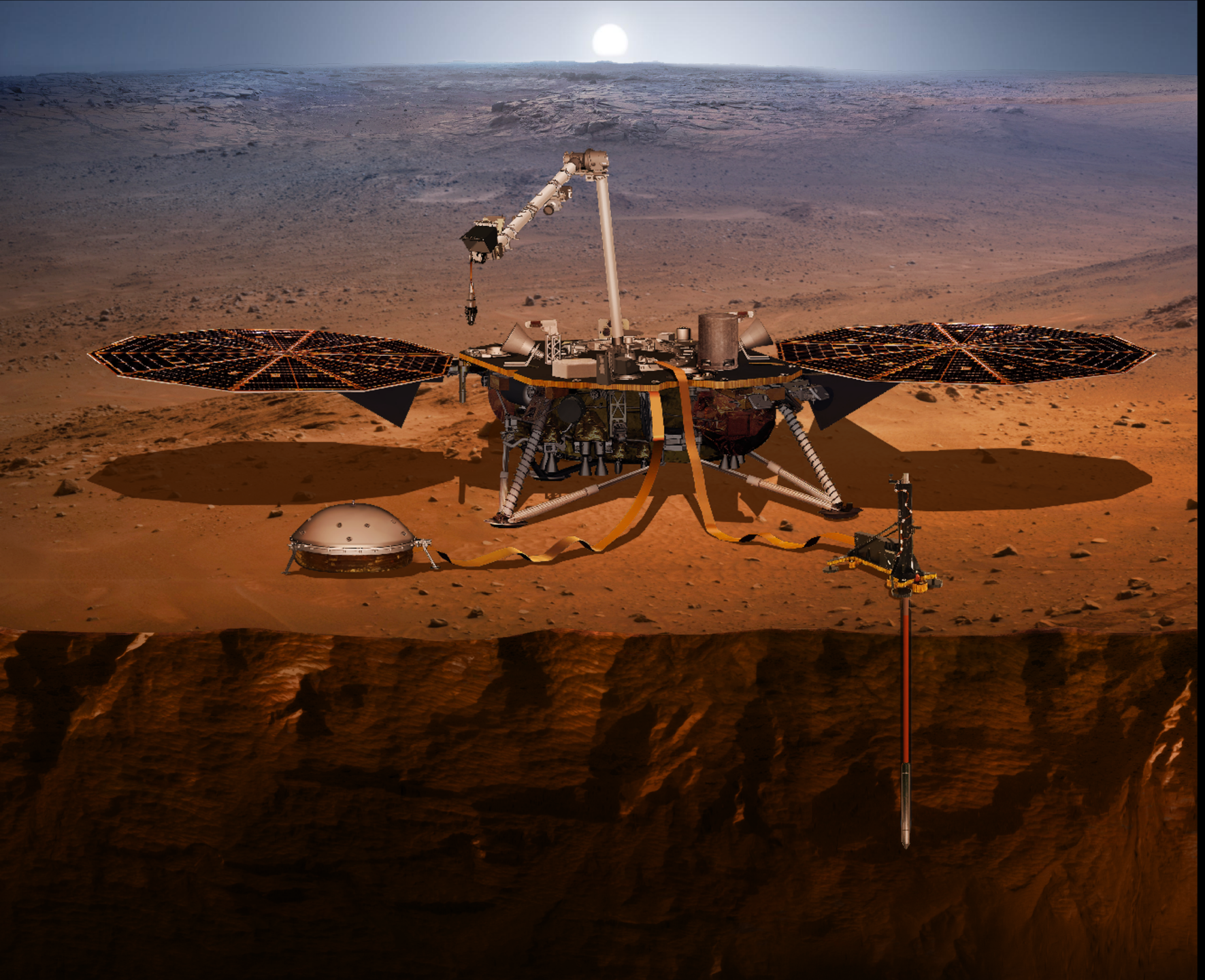


Sunrise on Mars



Sunset on Mars

InSight Project Team



Join the InSight team on Mars:

- https://mars.nasa.gov/insight/
  - Interact with Lander
  - “On a mission” Podcast
  - Lots of cool mission information